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Original Article

Plasmonic properties of one-dimensional metallic nanoparticle chains have been intensively studied mainly from the far-field spectroscopic measurements. In this paper, the authors experimentally investigated the plasmon coupling in finite 1-D gold nanoparticle chains directly from near field by photoemission electron microscopy (PEEM) using near infrared femtosecond laser pulses as the excitation source. They obtained the near-field mapping exhibiting the local field enhancement sites with ~ 10 nm spatial resolution. By further tuning the excitation wavelength, they could obtain the near-field spectra of the 1-D nanochains, revealing the energy splitting and the corresponding near-field mode distributions. The evolution of the near-field surface plasmon peak wavelengths with the chain length and the gap distances gave the same tendency as that observed in the far-field, providing the direct proof of the near-field coupling in the nanochains. Moreover, the energy transport along the gold nanochains in the near field was observed under oblique wide-field illumination. Together with numerical simulations, it was found that the near-field coupling and sub-radiant plasmonic modes induced by the retardation effect are responsible for the directional energy transport. These findings can deepen the understanding of plasmon coupling and energy transport in metallic nanostructures and promote the potential applications in plasmonic waveguides and biosensing.

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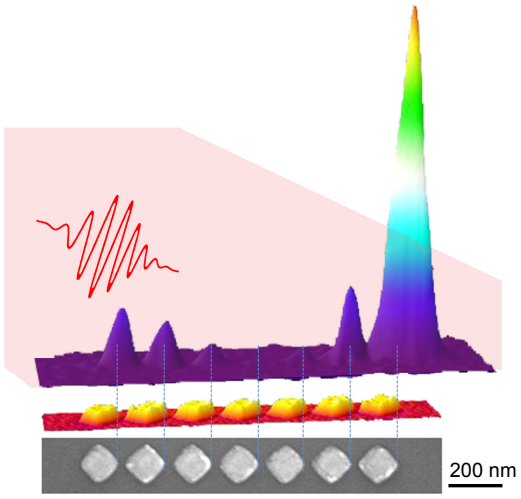

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Review

Plasmonic waveguides have played an increasingly important role in PICs design and optical interconnection. Considering the real application, crosstalk between plasmonic waveguides is an essential and inevitable issue. This paper reviews the recent progress of crosstalk research between plasmonic waveguides, including crosstalk evaluation methods and crosstalk suppression approaches. Usually, coupling length can be used to assess crosstalk roughly. There are three more precise crosstalk evaluation methods which have been summarized, based on comparison of specific parameters of waveguides, such as the ratio of coupling length to mean attenuation length, the ratio of the electric field intensity in the adjacent waveguide to the one in the main waveguide, and the output power in the second waveguide to the input power in the first waveguide. Besides, the four specific approaches of suppression crosstalk have been illustrated as two categories. One means is changing waveguide placement, and the other means is inserting medium. In the end, some extended researches and suggestions have been put forward. This review aims to provide valuable references for further research on applications of plasmonic waveguides in PICs design and optical interconnection.

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